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(56) Documents Cited

**EP 0849129 A1**

(58) Field of Search

**UK CL (Edition R ) B7B BSBCC**

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**Online: WPI, EPODOC, JAPIO**

(54) Abstract Title

**Side impact protection airbag**

(57) An airbag (1) for the protection of passengers from a side impact has a plurality of chambers (8). During an impact, gas flows into the airbag (1). A plurality of check valves (13) are provided to prevent the backward flow of gas from the chambers (8) so that the airbag (1) is maintained in an inflated state.

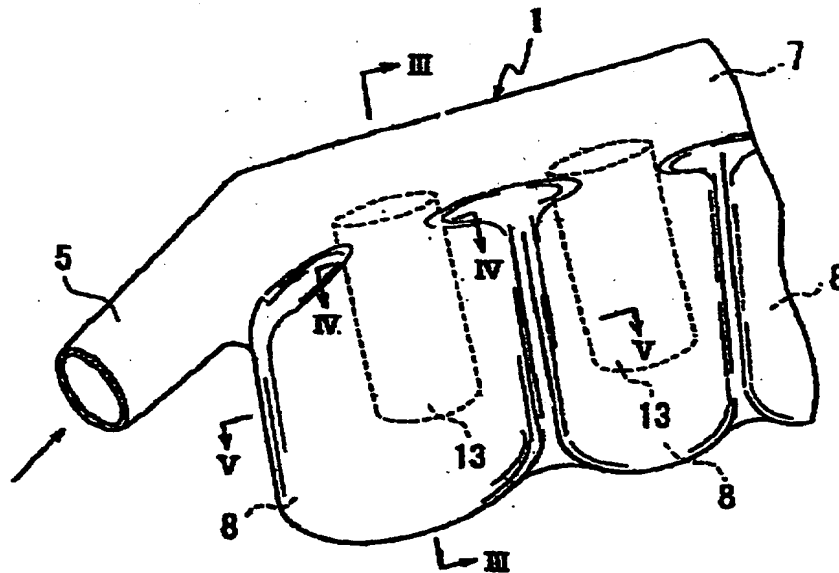


Fig. 2

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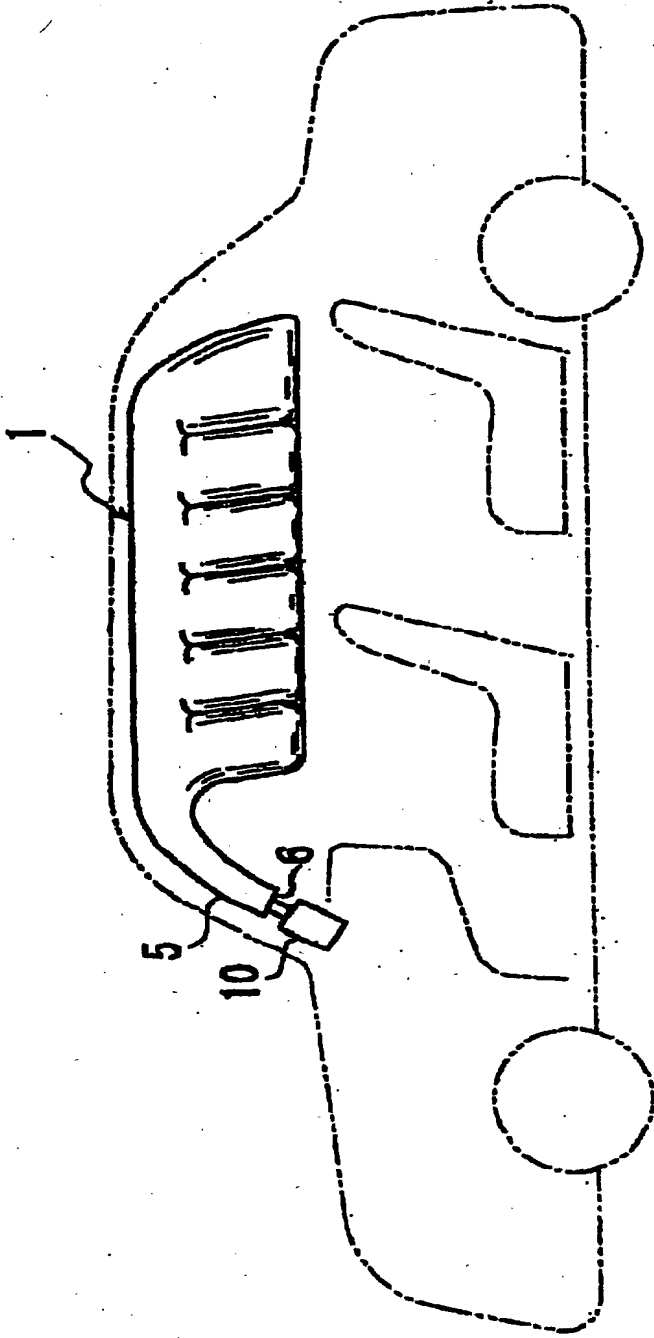


Fig. 1

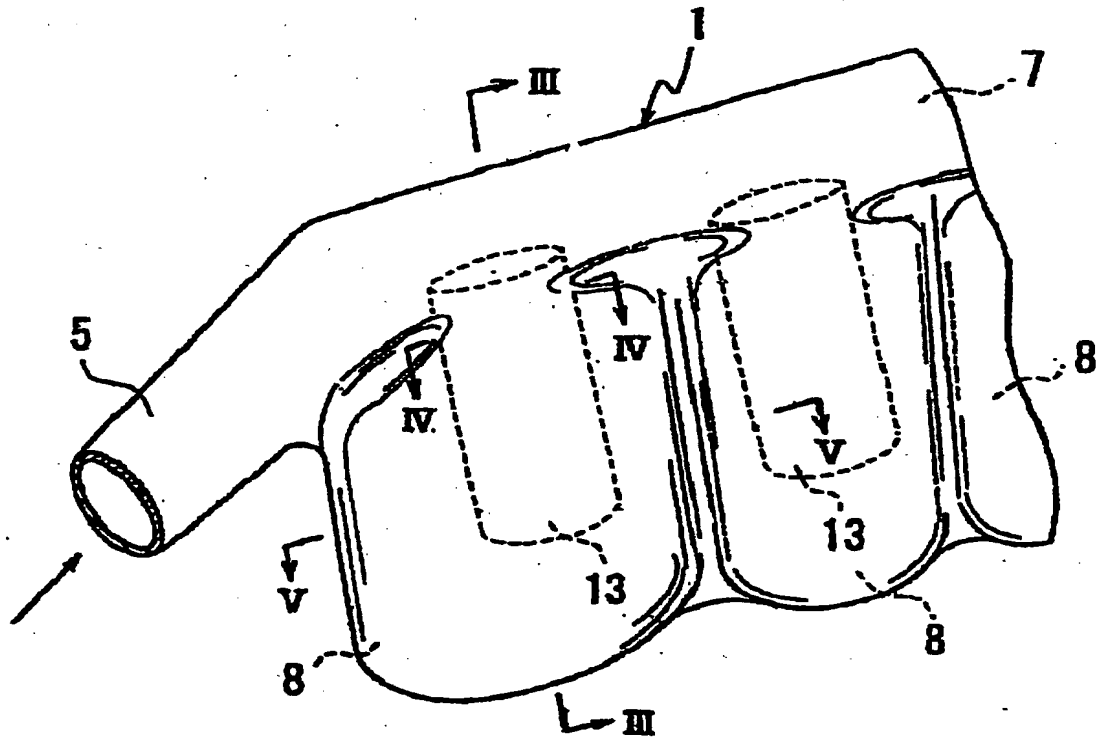


Fig. 2

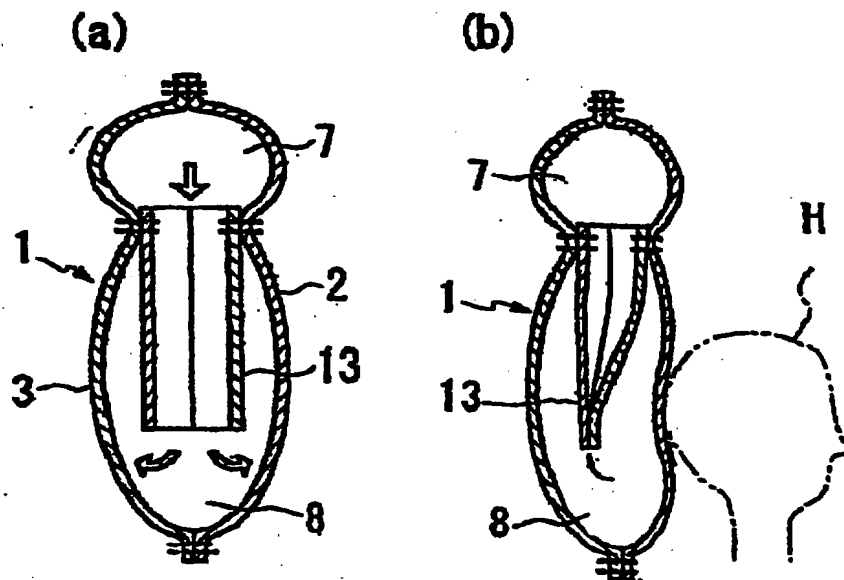


Fig. 3

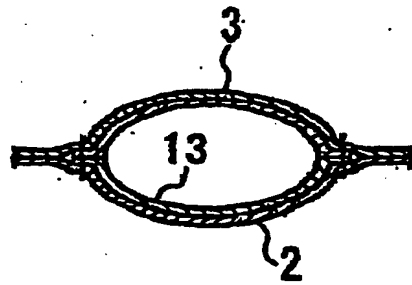


Fig. 4

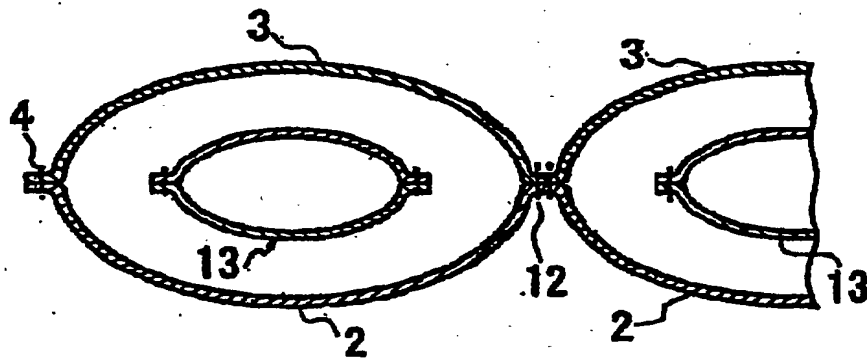


Fig. 5

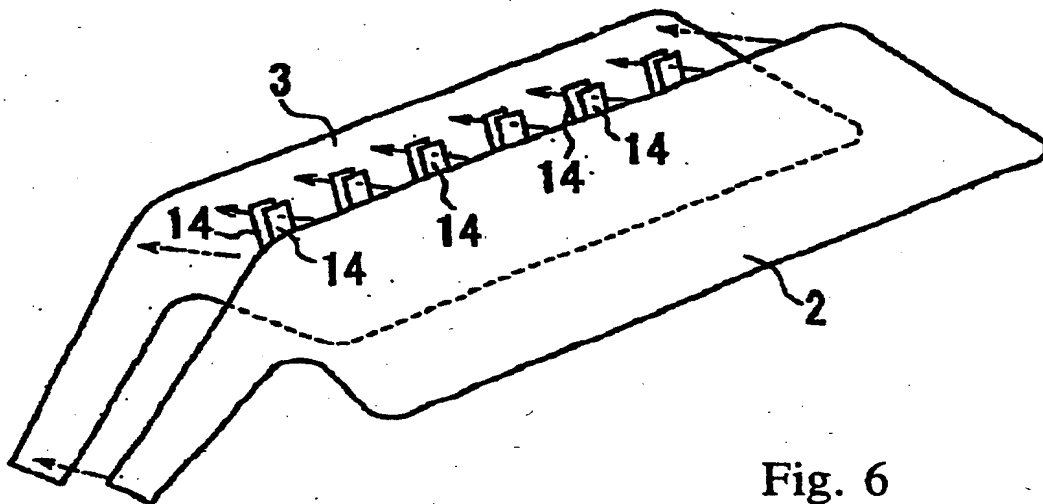


Fig. 6

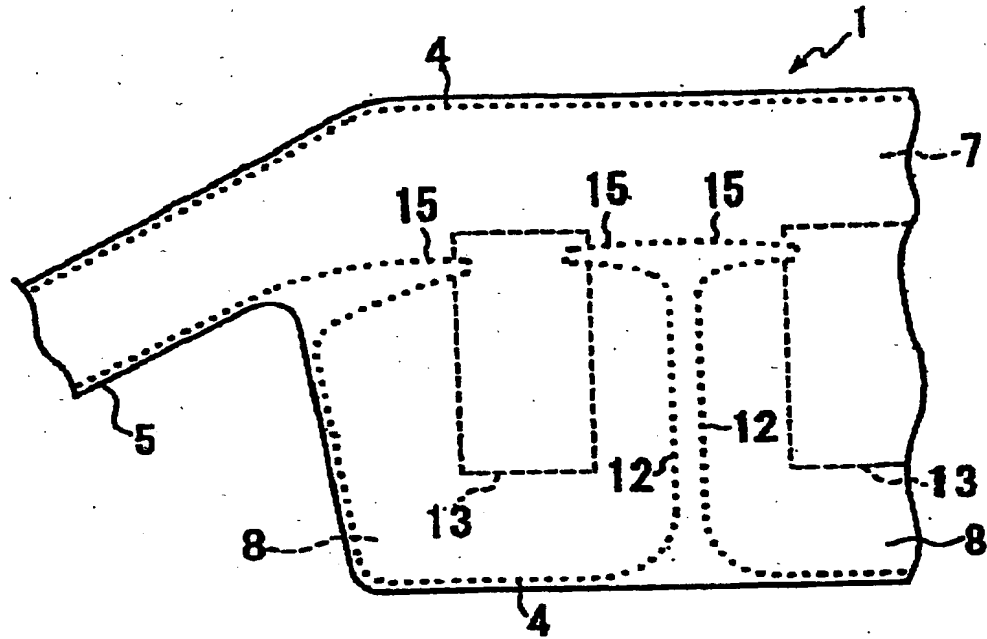


Fig. 7

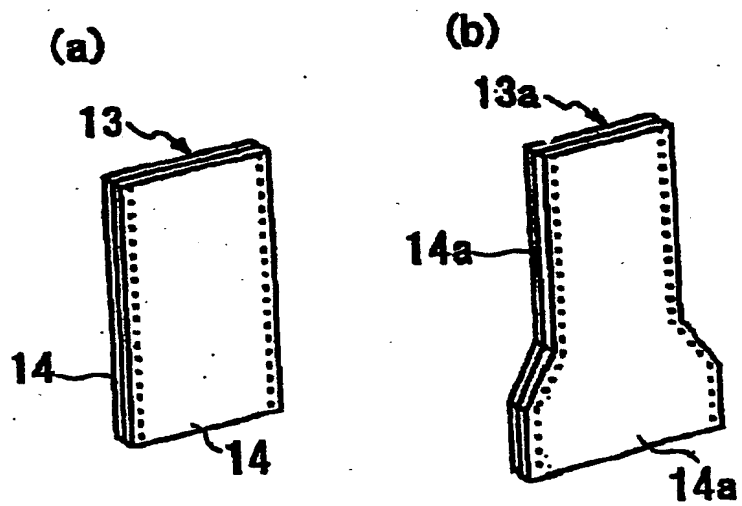


Fig. 8

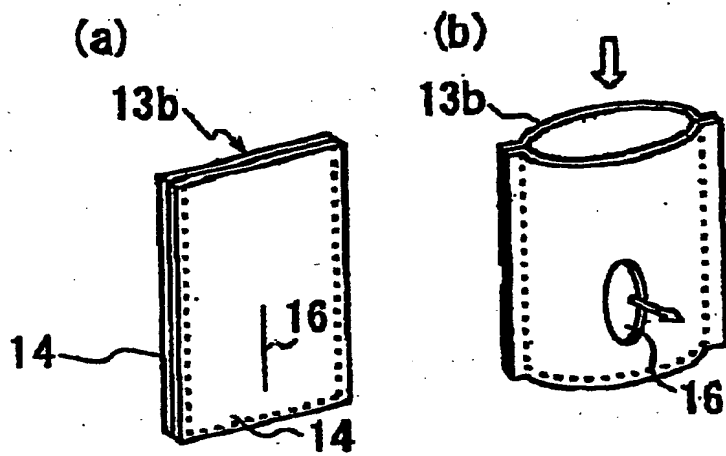


Fig. 9

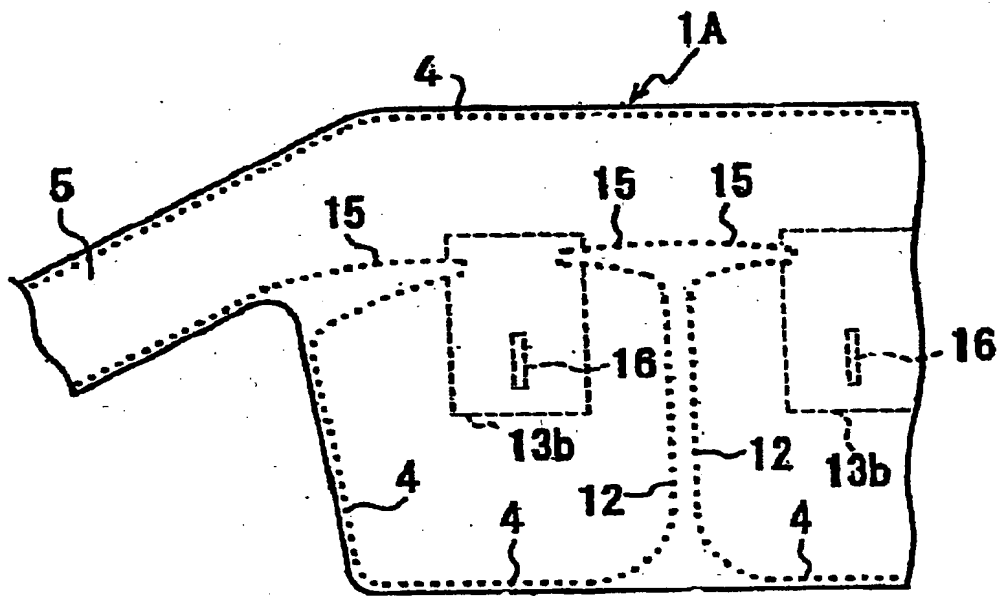


Fig. 10

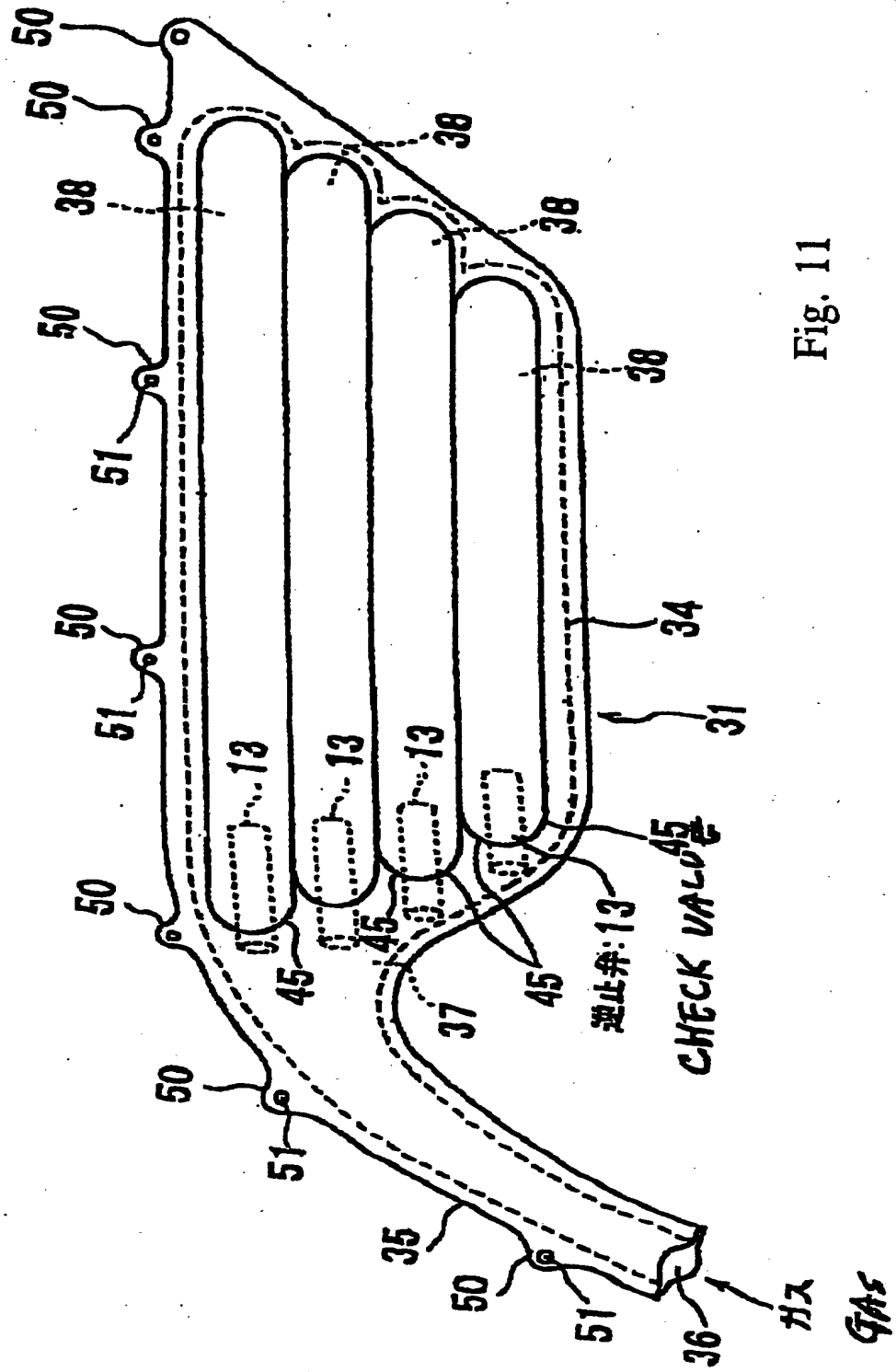


Fig. 11

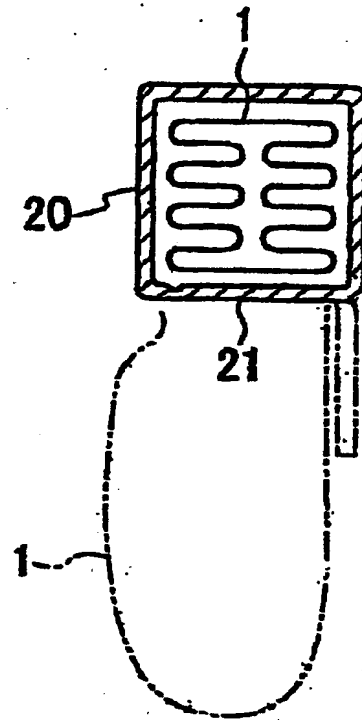


Fig. 12

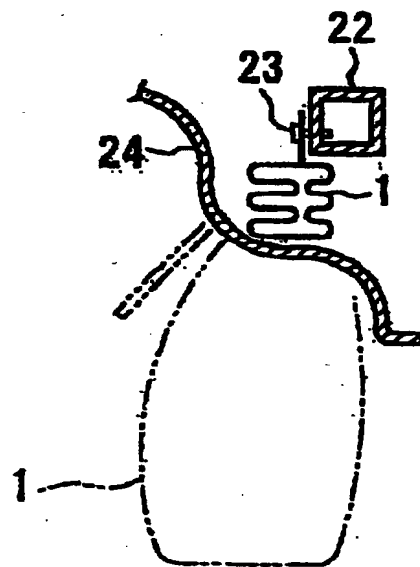


Fig. 13



PROTECTION BAG AND PROTECTION APPARATUS FOR HEAD PORTION OF  
AUTOMOBILE PASSENGER

Field of the Invention

The present invention relates to a protection bag for the head portion of an automobile passenger, and more specifically, to a bag which is inflated along the windows of side doors and the like when an automobile is crashed on a side surface or laid upside. Further, the present invention relates to a protection apparatus for the head portion of an automobile passenger using the protection bag.

Background to the Invention

A protection bag for the head portion of an automobile passenger is described in WO96/26087. In the known bag, a vacant chamber is composed of a duct portion, which extends from the end of the bag on front side of a vehicle (front end portion) to the end thereof on the rear side of the vehicle (rear end portion) along the upper edge of the bag, and a multiplicity of cell portions, which communicate with the duct portion and extend downward.

An object of the present invention to provide a protection bag for the head portion of an automobile passenger which is arranged such that after the bag is inflated, the inflated state is continued for a long period of time.

Further, an object of the present invention is to provide a bag which is less collapsed and deformed even if the body of a passenger is hit against the inflated bag and a protection apparatus for the head portion of an automobile passenger using the bag.

### Summary of the Invention

According to the present invention, there is provided a protection bag for the head portion of an automobile passenger which is disposed in the vicinity of the intersecting corner portion between the ceiling portion and a side surface portion of an automobile and inflated downward along the side surface portion by an introduced gas, characterized in that a plurality of small chambers are disposed in the bag as well as a backward flow prevention means for preventing the backward flow of the gas from the upper portions of the small chambers into the gas introduction chamber is disposed to at least one small chamber.

In the protection bag for the head portion of the automobile passenger, since the backward flow of the gas from the small chambers of the bag is prevented after the small chambers are inflated, the bag continues an inflated state for a long period of time.

When the head portion and the shoulder portion of a passenger are hit against the inflated bag, the gas tends to flow out in a direction opposite to the flow-in direction thereof. However, since the flow-out of the gas is prevented by the backward flow prevention means, only the small chambers against which the head portion is hit are collapsed and deformed. Since the volume of the small chambers is greatly smaller than that of the bag as a whole, the inside pressure of the small chambers is increased in inverse proportion to the reduction of the volume of the small chambers so that an amount of collapse and deformation of the bag is small.

It is preferable that the backward flow prevention means is a check valve. The check valve is preferably composed of sheets such as cloths or the like.

In the present invention, it is preferable that the bag is composed of two sheets overlapped each other and the small chambers are disposed between the sheets by coupling both the sheets along the outside edges thereof. In an embodiment of the present invention, a gas introduction bag which extends along the upper portion of an inflated bag and a plurality of small chambers the upper portions of which communicate with introduction chamber are disposed in the interior of the bag, and the backward flow means is disposed to prevent the backward flow of the gas from the upper portions of the small chambers into the gas introduction chamber.

In another embodiment of the present invention, a gas introduction chamber and a plurality of small chambers which communicate with the gas introduction chamber and extend in the forward and backward directions of the bag are disposed in the interior of the bag, and a the backward flow prevention means is disposed to prevent the backward flow of a gas from the small chambers into the gas introduction chamber.

A protection apparatus for the head portion of an automobile passenger of the present invention includes the protection bag.

It is preferable that the protection apparatus for the head portion of an automobile passenger of the present invention includes a gas generator for supplying a gas into the protection bag and a means for covering the protection bag and opens toward the interior of a vehicle compartment when the protection bag is inflated.

### Brief Description of the Drawings

Examples of the present invention will now be described in detail with reference to the accompanying drawings, in which:

Fig. 1 is a front elevational view of a bag according to an embodiment.

Fig. 2 is a perspective view of a part of the bag.

Fig. 3 is a sectional view taken along the line III - III of Fig. 2.

Fig. 4 is a sectional view taken along the line IV - IV of Fig. 2

Fig. 5 is a sectional view taken along the line V - V of Fig. 2

Fig. 6 is an exploded perspective view of the bag of Fig. 1.

Fig. 7 is an enlarged view of a part of the bag of Fig. 1.

Fig. 8 is a front elevational view of a check valve.

Fig. 9 is a perspective view of the check valve.

Fig. 10 is a front elevational view of a part of the bag using the check valve.

Fig. 11 is a front elevational view of a protection bag for the head portion of an automobile passenger according to another embodiment of the present invention.

Fig. 12 is a sectional view of the protection apparatus including the protection bag of the present invention.

Fig. 13 is a sectional view of the protection apparatus including the protection bag of the present invention.

#### Detailed Description

In the bag 1, two sheets, that is, a passenger side sheet 2 and a vehicle body side sheet 3 are overlapped each other and the peripheral edges of the sheets 2 and 3 are sewed with a thread 4, thereby forming a vacant chamber between both the sheets 2 and 3. Note that a coupling means such as bonding, welding, and the like may be employed in place of sewing with the thread 4.

A connecting portion 5 is extended from the front portion of the bag 1 to connect the bag 1 to an inflator 10 which is installed to the A pillar or the like of an automobile. The connecting portion 5 extends along the A pillar and a gas introduction port 6 is disposed at the front end thereof. The inflator 10 generates a gas when the automobile is crushed or laid upset.

The vacant chamber in the bag 1 is composed of an introduction chamber 7, which extends along the upper side of the bag 1, and a plurality of small chambers 8, which are disposed on the lower side of the introduction chamber 7 in parallel with each other.

To form the small chambers 8, the sheets 2 and 3 are coupled with each other by longitudinal linear coupling portions 12. The coupling may be performed by any of sewing, bonding, welding and the like.

Each of the small chambers 8 is sealed at both sides and a lower portion and an upper portion communicates with the introduction chamber 7 through a check valve 13. As shown in Fig. 8(a), the check valve 13 is arranged such that two rectangular cloths 14, 14 are overlapped each other and both the sides edges

thereof are coupled with each other by sewing or the like. As shown in Fig. 7, the sheets 2 and 3 are sewed to each other through lateral linear coupling portions 15 to partition the introduction chamber 7 from the small chambers 8. The lateral linear coupling portions 15 partially come into the check valves 13.

In the bag 1, the connecting portion 5 is disposed along the A pillar of the automobile and a main unit, which is composed of the introduction chamber 7 and the small chambers 8, is disposed along the vicinity of the intersecting corner portion between the ceiling portion and a side surface portion of the automobile.

As shown in Fig. 12, in an embodiment of the present invention, the main unit is folded and accommodated in a case 20. The case 20 is composed of, for example, a long box-shaped member which extends along a roof side member of the automobile. At least a portion 21 of the surface of the case 20 which faces the compartment of a vehicle can be opened toward the compartment of the vehicle. When a gas is supplied from the inflator 10 into the bag 1, the portion 21 is pressed by the bag 1, which tends to inflate, and opened so that the bag 1 is inflated in the compartment of the vehicle.

As shown in Fig. 13, in another embodiment of the present invention, the bag 1 is slenderly folded and disposed along a roof side member 22. The upper side portion of the bag 1 is fastened to the roof side member 22 with fasteners 23 such as bolts, rivets or the like. The bag 1 is covered with an interior material 24 of the automobile. When a gas is supplied from the inflator 10 into the bag 1, the interior material 24 is pressed by the bag 1, which tends to inflate, and broken and opened so

that the bag 1 is inflated in the compartment of the vehicle.

When the inflator 10 generates the gas, the gas flows into the introduction chamber 7 from gas introduction port 6 through the connecting portion 5. The gas flows from the introduction chamber 7 into the respective small chambers 8 through the check valves 13 and inflates the respective small chambers 8 as shown in Fig. 3(a). As the bag 1 is inflated, a bag cover material such as the case, the interior material and the like which covers the bag 1 is broken, whereby the bag main unit including the respective small chambers 8 is instantly inflated along the windows or the doors of the vehicle.

Since the gas, which has flown into the respective small chambers 8, is prevented from backwardly flowing into the introduction chamber 7 by the check valves 13 as shown in Fig. 3(b), the respective small chambers 8 continue the inflated state for a long period of time. When the head H, the shoulder or the like of a passenger is hit against the small chambers 8 of the inflated bag 1, the small chambers 8 are collapsed and deformed. However, since the flow-out of the gas from the small chamber 8 is prevented by the check valve 13 as shown in Fig. 3(b), the pressure in the small chamber 8 is increased in inverse proportion to the collapse and deformation (reduction of volume) of the small chamber 8. Therefore, even if the passenger is hit against the small chambers 8, the small chambers 8 are collapsed only very shallowly.

In the above embodiment, while the cloths 14, 14 which constitute the check valve 13 is formed in a rectangular shape, a check valve 13a using cloths 14a whose shape is such that their lower sides are widened may be used as shown in Fig. 8(b).

As the check valve, a check valve 13b, which is composed of cloths 14, 14 having right and left sides and lower side sewed each other and in which one of the cloths is provided with a slit 16, may be used as shown in Fig. 9(a). When the gas is introduced into the check valve 13b from the introduction chamber 7 side, the slit 16 is opened and the gas flows into the small chambers 8 as shown in Fig. 9(b). When the gas tends to flow backwardly from the interior of the small chambers 8 to the gas introduction chamber 7 side, the slit 16 is closed and the backward flow is prevented. Fig. 10 is a front elevational view of a part of a bag 1A employing the check valve 13b.

Fig. 11 is a front elevational view of a protection bag 31 for the head portion of an automobile passenger according to another embodiment of the present invention. Also in the bag 31, two sheets, that is, a passenger side sheet 2 and a vehicle body side sheet 3 are overlapped each other and the peripheral edge portions of the sheets are sewed with a thread 4, thereby forming a vacant space between both the sheets. Note that a coupling means such as adhesion, welding, and the like may be employed in place of sewing with the thread 34.

A connecting portion 35 is extended from the front portion of the bag 31 to connect the bag 31 to an inflator 10 which is installed to the A pillar or the like of an automobile. The connecting portion 35 extends along the A pillar and a gas introduction port 36 is disposed at the front end thereof.

The vacant space in the bag 31 is composed of an introduction chamber 37 which is located at the front portion of the bag 31 and a plurality of small chambers 38 which is connected to the introduction chamber 37 and disposed in parallel with each other



in the lengthwise direction (forward/backward direction) of the bag 31.

To form the small chambers 38, the passenger side sheet is coupled with the vehicle body side sheet by lateral linear coupling portions 42. The coupling may be performed by any of sewing, bonding, welding and the like.

The small chambers 38 are sealed at both upper and lower side portions and a rear portion, and a front portion communicates with the introduction chamber 37 through the check valve 13. The check valve 13 is the one shown in Figs. 8(a) and (b) or the one shown in Fig. 9(a) and (b). The passenger side sheet is sewed with the vehicle side sheet by longitudinal linear coupling portions 45 to partition the introduction chamber 37 from the small chambers 38. The longitudinal linear coupling portions 45 partially come into the check valves 13.

Also in the bag 31, a connecting portion 35 is disposed along the A pillar of the automobile, and a main unit, which is composed of the introduction chamber 37 and the small chambers 38, is disposed along the vicinity of the intersecting corner portion between the ceiling portion and a side surface portion of the automobile.

When the inflator 10 generates a gas, the gas flows into the introduction chamber 37 from gas introduction port 36 through the connecting portion 35. The gas flows from the introduction chamber 37 into the respective small chambers 38 through the check valve 13 and inflates the respective small chambers 8. As the bag 31 is inflated, a bag cover material such as a case, an interior material and the like which covers the bag 31 is broken, whereby the bag main unit including the respective small chambers 38 is

instantly inflated along the windows or the doors of the automobile.

Since the gas, which has flown into the respective small chambers 38, is prevented from backwardly flowing into the introduction chamber 37 by the check valve 13, the respective small chambers 38 continue the inflated state for a long period of time. When the head H, the shoulder or the like of a passenger is hit against the small chambers 38 of the inflated bag 31, the small chambers 38 are collapsed and deformed. However, since the flow-out of the gas from the small chambers 38 is prevented by the check valve 13, the pressure in the small chambers 38 is increased in inverse proportion to the collapse and deformation (reduction of volume) of the small chambers 38. Therefore, even if the passenger is hit against the small chambers 38, the small chambers 38 are collapsed only very shallowly.

Note that a plurality of ear portions 50 are projected from the upper side of the bag 31 at predetermined intervals. Small holes 51 are formed at the ear portions 50. Fasteners such as bolts, rivets or the like are caused to pass through the small holes 51 and fastened to a roof side rail or the like to thereby couple the bag 31 with a vehicle body.

While the introduction chamber 7 is disposed to the front portion of the bag 31 in the embodiment, it may be disposed to the rear portion of the bag 31.

As described above, in the protection bag and the protection apparatus for the head portion of an automobile passenger of the present invention, when a gas is introduced from the inflator, the protection bag maintains an inflated state for a long period of time. Further, when the head and the shoulder of a passenger are hit against the inflated bag, an amount of collapse and deformation of the bag is small

## CLAIMS

1. A protection bag for the head portion of an automobile passenger disposed in the vicinity of the intersecting corner portion between the ceiling portion and a side surface portion in the compartment of an automobile and inflated downward along the side surface portion by an introduced gas, in which a plurality of small chambers are disposed in the bag as well as a backward flow prevention means for preventing the backward flow of the gas from the small chambers, provided to at least one small chamber.
2. A protection bag according to claim 1, in which the backward flow prevention means is a check valve.
3. A protection bag according to claim 1 or 2, in which the backward flow prevention means is composed of sheets such as cloths or the like.
4. A protection bag according to any of claims 1 to 3, in which a gas introduction bag which extends along the upper portion of the inflated bag and a plurality of the small chambers the upper portion of which communicate with introduction chamber are disposed in the interior of the protection bag and the backward flow prevention means is disposed to prevent the backward flow of the gas from the small chambers into the gas introduction chamber.

5. A protection bag according to any of claims 1 to 3, in which a gas introduction chamber and a plurality of small chambers which communicate with the gas introduction chamber and extend in the forward and backward directions of the bag are disposed in the interior of the protection bag and the backward flow prevention means is disposed to prevent the backward flow of the gas from the small chambers into the gas introduction chamber.

6. A protection bag according to any of claims 1 to 5, in which the bag is composed of two sheets overlapped each other and the small chambers are disposed between the sheets by coupling both the sheets along the outside edges thereof.

7. A protection apparatus for the head portion of an automobile passenger including a protection bag disposed in the vicinity of the intersecting corner portion between the ceiling portion and a side surface portion in the compartment of an automobile and inflated downward along the side surface portion by an introduced gas, in which the protection bag is a bag according to any one of claims 1 to 6.

8. A protection apparatus according to claim 7, in which the protection apparatus comprises a gas generator for supplying a gas into the protection bag and a means for covering the protection bag and opens toward the interior of a vehicle compartment when the protection bag is inflated.

9. A protection bag substantially as shown in and/or described with reference to any of Figures 1 to 13 of the accompanying drawings.

10. A protection apparatus substantially as shown in and/or described with reference to any of Figures 1 to 13 of the accompanying drawings.



INVESTOR IN PEOPLE

**Application No:** GB 0012503.9  
**Claims searched:** 1 - 10

**Examiner:** Peter Macey  
**Date of search:** 3 August 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B7B (BSBCC)

Int Cl (Ed.7): B60R 21/16

Other: Online: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0849129 A1 (VOLKSWAGEN) see figure 1 and column 6, lines 51 - 57	1, 2, 7, 8

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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